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MONTHLY REPORT - MAY 1979

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MONTHLY REPORT - MAY 1979

STATUS OF PUBLICATIONS

Approved by Center Director

Hewitt, Roger P. and Paul E. Smith. Sonar mapping in the California Current area: Considerations of sampling strategy. For publication in the Journal of the Fisheries Research Board of Canada.

Hunter, John R. and Carol Kimbrell. Early life history of Pacific mackerel, Scomber japonicus. For publication in the Fishery Bulletin, U.S.

Huppert, D.D. An analysis of the U.S. demand for fish meal. For publication in the Fishery Bulletin, U.S.

Mendelssohn, Roy. Bounds by dominance for fixed-weight aggregated Markov decision processes. For publication in Oper. Res.

O'Connell, Charles P. Estimation by histological methods of the percent of starving larvae of the northern anchovy, Engraulis mordax, in the sea. For publication in the Fishery Bulletin, U.S.

Parker, Keith. Direct estimation of spawning frequency and spawning biomass in a multispawning pelagic species. For publication in the Fishery Bulletin, U.S. as a Note.

THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.

Published

Ahlstrom, Elbert H., H. Geoffrey Moser and Elaine M. Sandknop. 1978. Distributional atlas of fish larvae in the California Current region: rockfishes, Sebastes spp., 1950 through 1975. California Cooperative Oceanic Fisheries, No. 26, 178 p.

This is the sixth CalCOFI Atlas dealing with fish eggs and larvae of the California Current region; it has the most extensive coverage of any of the Atlases dealing with fish and larvae since rockfish larvae on 178 CalCOFI cruises are included. During 1950-1975 there were altogether 181 CalCOFI cruises, excluing NORPAC; Rockfish larvae were taken on all but 3 of the cruises in sufficient occurrences (only cruises with 5 or more occurrences are included in the Atlas). With the appearance of this Atlas, distribution of the common larvae that make up about 90% or more of the total larvae taken on CalCOFI surveys are represented in CalCOFI Atlases.

Previous CalCOFI Atlases dealing with California Current Fish eggs and larvae are No. 9 (Kramer and Ahlstrom on larvae of northern anchovy), No. 11 (Ahlstrom on larvae of jack mackerel and hake), No. 12 (Kramer on eggs and larvae of the Pacific sardine), No. 17 (Ahlstrom on six common mesopelagic fishes), No. 23 (Ahlstrom and Moser on flatfish larvae - 6 species and 2 genera.

Greenblatt, Paul R. 1979. Associations of tuna with flotsam in the eastern tropical Pacific. Fishery Bulletin, U.S. 77(1):147-155.

The fishing record for flotsam-associated tuna in the eastern tropical Pacific was examined. The rivers of Central America are probably the major source of flotsam. Correlation analysis of the number of sets occurring in an area indicates that unassociated tuna and flotsam-associated tuna are related. The number of sets made on floating objects has increased dramatically since 1971. The percentage of flotsam-associated sets has increased, indicating that flotsam-associated sets are more important to the tuna fishery than in 1963. The catch per set of tuna associated with flotsam has also increased markedly since 1967. Analysis of length-frequency data indicate that, on a single set basis, tuna fork length is more variable in sets associated with flotsam than with unassociated schoolfish sets. Results of the length-frequency analysis support the idea that flotsam aggregates tuna.

Smith, T.D. and T. Polacheck. 1979. Analysis of a simple model for estimating historical population sizes. Fishery Bulletin, U.S. 76(4):771-779.

Estimates of historical abundance of animal populations are important in many management decisions. Historical estimates based on a simple model of population growth have been made for several populations of dolphin involved with the yellowfin tuna purse seine fishery. We used the data for the bridled dolphin,

Stenella attenuata, to investigate the behavior of the model by which these historical estimates were calculated. For populations with low net reproductive rates, the effect of bias in the estimates of the input parameters on the estimated historical abundances was approximately linear and additive. When all the input parameters were independently estimated, the variances of the historical abundance estimates were dominated by the variance of the initial abundance estimate and the coefficient of variation of the historical estimate was less than the largest coefficient of variation of any parameter.

Sumida, B.Y., E.H. Ahlstrom and H.G. Moser. 1979. Early development of the eastern North Pacific with heavily pigmented larvae (Pisces, Pleuronectiformes). Fishery Bulletin, U.S. 77(1):105-145.

Eggs and larval series are described for six species of flatfishes occurring off California with heavily pigmented larvae. These are the pleuronectids Pleuronichthys coenosus, P. decurrens, P. ritteri, P. verticalis, and Hypsopsetta guttulata and the bothid, Hippoglossina stomata. A brief description of postflexion larvae of the Gulf of California species, P. ocellatus, is also presented.

Eggs of Pleuronichthys are unusual among flatfishes in possessing a sculptured chorion composed of a network of polygonal walls, whereas the chorions of Hypsopsetts guttulata and Hippoglossina stomata eggs are smooth and unornamented. Eggs of Hypsopsetts guttulata and P. ritteri are unusual among those of pleuronectid flatfishes in possessing an oil globule.

A combination of pigmentation, morphology, and meristics can distinguish the seven species of flatfishes with heavily pigmented larvae. Larvae of two species, H. guttulata and P. decurrens, have distinctive pterotic spine on either side of the head. Sizes at hatching, at fin formation, and at transformation are important considerations to distinguish these species. Meristic counts, particularly of precaudal and caudal groups of vertebrate, are important to relate a larval series to its juvenile and adult stages and thus substantiate identification of the series.

Translations

Ogawa, Yadai. 1979. Accumulation of unfavorable conditions results in record low skipjack tuna landings (Warujōken ga kasanatte saitei no mizuage). [In Jpn.] Suisan Sekai 28(2):34-39. (Engl. transl. by Tamio Otsu, 1979, 9 p., Transl. No. 34.)

Sasaki, Takashi. 1978. The progress and present status of the seamount fishing ground development program (Kaizan gyojyō kaihatsu no keika to genjō). Bull. Jpn. Soc. Fish. Oceanogr. 33:51-53. (Engl. transl. by Tamio Otsu, 1979, 6 p., Transl. No. 35.)

Administrative Reports

SWFC. Director's Report to the 30th Tuna Conference on Tuna and Tuna-Related Activities. Adm. Report No. LJ-79-12.

Bratten, D., W. Ikehara, K. Pryor, P. Vergne, and J. DeBeer. The Tuna/Porpoise Problem: Dedicated Vessel Research Program--Summary of Research Results from the Second Leg of the Third Cruise of the Dedicated Vessel 20 July to 18 August 1978. Adm. Report. No. LJ-79-13.

Powers, J. E., R. Butler, J. Jennings, R. McLain, C. Peters and J. De Beer. The Tuna/Porpoise Problem: Dedicated Vessel Research Program--Summary of Research Results from the Fourth Cruise of the Dedicated Vessel 12 September to 31 October 1978. Adm. Report. No. LJ-79-14.

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

Cooperating Agencies Provide Input to Northwestern Hawaiian Islands Cruise Plans

Richard N. Uchida, Leader, Insular Resources Task at the Honolulu Laboratory, reported that participating agencies in the Cooperative Study for the Assessment of the Living Resources of the Northwestern Hawaiian Islands (NWHI), including the Hawaii Division of Fish and Game (HDFG), the U.S. Fish and Wildlife Service, and the University of Hawaii (UH) Sea Grant Program provided planning input for the forthcoming cruise of the NOAA research vessel Townsend Cromwell. All the research requirements of the cooperating agencies were integrated into the cruise plans and the final instructions for the cruise (TC-79-03) were issued.

Part I of the cruise will be the second phase of a study by Dr. Jed Hirota of the UH Sea Grant Program involving primary and secondary productivity of waters in the Hawaiian Archipelago. Both National Marine Fisheries Service (NMFS) and HDFG will be involved in Part II, which includes field work such as trap fishing for lobsters, fish, and shrimp, handlining for snappers, groupers, and carangids, bottom trawling in the nearshore and offshore waters, and conducting fish counts in the NWHI.

Sampling of Fish for Ciguatera Studies Intensified

Research Assistants Bernard M. Ito and Paul M. Shiota fabricated a tissue sampling kit and began collecting samples of kahala, Seriola dumerilii, at the local marketplace for ciguatera studies. Ito reported that tissue samples were collected from 47 specimens during the month and also that he has been working with Research Assistant Brian Joyo in running the samples through the enzyme-linked immunological test (ELISA), and the radioimmunoassay (RIA) test. These tests are being conducted at the Pathology Department of the John A. Burns School of Medicine, UH, under the supervision of Dr. Yoshitsugi Hokama. The impetus for this program was provided by a recent outbreak of ciguatera-related illnesses among residents on the islands of Oahu and Kauai implicating the kahala.

The ciguatera outbreaks have become a source of concern to the Hawaiian community and a series of meetings have been held among representatives of the Honolulu Laboratory and several State agencies including the HDFG, Department of Health, UH, and the Office of the Marine Affairs Coordinator. Topics of discussion at these meetings included the Honolulu Laboratory market sampling program for kahala, possible sources of funding for the sampling program, and the accessibility of a ciguatera testing program for all members of the local Fish Dealers Association.

Commercial Fishing for Spiny Lobsters in Northwestern Hawaiian Islands Continues

Biological Technician P. Shiota reported that arrangements were made with the Keola to place a Honolulu Laboratory observer aboard to collect catch, effort, and other biological data on the Keola's fishing operations in the NWHI. The Keola departed for the NWHI with Research Assistant Andrew J. Aldridge on board. However, the cruise was aborted after only a few days of fishing owing to engine failure and the Keola was towed back to Honolulu by the Easy Rider which was also fishing in the area. Research Assistant Bert S. Kikkawa was the Honolulu Laboratory's observer on the Easy Rider.

Good Trawl Catches of Pelagic Armorhead Made on Hancock Seamounts

Fishery Biologist Reginald M. Gooding reported that he spent approximately a week on board the Townsend Cromwell (cruise TC-79-02) to supervise bottom trawling operations at the Hancock Seamounts. Gooding noted that the catches of pelagic armorhead, Pentaceros richardsoni, made in the Northeastern trawls were exceptionally good and the best experienced on the Cromwell. A total of over 2,000 specimens was taken in several trawl hauls.

Northwestern Hawaiian Islands Studies Continue

Research Assistant Victor Honda continued work analyzing spiny lobster, Panulirus marginatus, catches around Necker Island in relation to moon phases between October 1976 and November 1978. Data were insufficient in some 6-min square statistical areas for any statistical tests. However, moon phases did not appear to be correlated with lobster catches in statistical areas having sufficient data.

Dr. Jeffrey Polovina, Statistician, and Research Assistant Darryl T. Tagami continued stock assessment studies of the spiny lobster population at Necker Island.

Biological Technician Bert Kikkawa began a fecundity study of snappers in the NWHI. Initially, he searched the literature for fecundity study methodology to establish basic procedures for his study and began an examination of Rooseveltia brighami ovaries.

Hawaii Skipjack Tuna Landings Continue Below Long-Term Average

The May 1979 Hawaii landings of skipjack tuna were estimated at 496.0 metric tons (MT), which is 17.9 MT above the May 1978 landings and 11.4 MT above the 1948-78 long-term average for May. The cumulative landings from January through May were estimated at 1,043.7 MT, which is 2.4.4 MT below the 1978 landings for the same period and 45.5 MT below the 1948-78 long-term average for the same period.

First Test Tuna Introduced into Temperature Preference Tank System

Dr. Andrew E. Dizon, Leader, Experimental Ecology of Tunas, reported that a 50-cm yellowfin tuna placed into the newly-constructed temperature preference tank system has provided the first experimental evidence of behavioral thermoregulation in a tuna, or for that matter, any other high seas pelagic fish.

The tank system was designed to allow the fish to regulate environmental temperature itself by "shuttling" between two adjacent 18 ft. diameter tanks containing water kept at temperatures differing by approximately 0.5° C. When the fish is in the warmer of the two tanks, temperature in both tanks rise at a rate of 0.33° C per hour. When the fish shuttles into the adjacent tank, photocell sensors in the connecting tunnel transmit this information to a small computer which causes temperature in both tanks to decrease 0.33° C per hour. Thus, by positioning itself or merely spending more time in the tank with temperature nearest its preferred temperature, the fish can regulate the environmental temperature.

The initial results were quite promising. The yellowfin tuna maintained the tank system at 28°-29° C, and in addition, when temperatures were altered to 26° C or 32° C, the fish caused the tank temperature to return to levels within its preferred range.

In connection with the behavioral thermoregulation studies, Dr. William Neill, Associate Professor, Department of Wildlife and Fisheries Sciencies, Texas A&M University, and former leader of the Experimental Ecology of Tunas Task, visited Honolulu for discussions with Dizon and staff on temperature preference testing paradigms. One primary purpose of Neill's visit was to develop a model that would simulate a tuna's movements and temperature responses in a system such as the newly- constructed tank system. To develop the model, rates of temperature change and shuttle movements approximating that observed to date were used. It was also assumed that the model fish shuttled between the two tanks independently of temperature.

At a shuttle rate of 1.42 passes/min (mean for the experimental fish) and a rate of temperature change 0.05° C/min, randomly shuttling fish would be expected to maintain tank water temperature within 2° C of the initial temperature for at least 30 days. Thus, the modeling exercise indicated the need to displace the experimental fish from its temperature preferendum to demonstrate behavioral thermoregulation.

Slowly Increasing Trend Noted in Size of Kawakawa Ova

Visiting Scientist Dr. Calvin Kaya at the Honolulu Laboratory reported that the third monthly gonadal biopsies of the kawakawa in tanks D and E were conducted on May 15. These biopsies are part of a continuing experiment to

induce spawning in captive tuna. Results of measurements of 25 ova of the largest size-class in each sample, and a comparison of these measurements with that from the previous biopsies are summarized below.

	Date	N	Range	Median	Mean
Tank D	5/15	6	0.19-0.29	0.26	0.25
	4/17	5	0.14-0.30	0.21	0.22
	3/13	4	0.09-0.12	0.11	0.11
Tank E	5/15	12	0.11-0.53	0.22	0.24
	4/18	12	0.12-0.43	0.18	0.21
	3/20	12	0.10-0.24	0.13	0.14

Although there was a continued trend toward increasing ova diameters, most of the females were still only in relatively early stages of maturation, as were wild fish of a similar size sampled a month ago. Wild specimens from local waters were not available since this last biopsy.

On May 25, two live specimens were brought back by the Townsend Cromwell from a cruise to the Northwestern Hawaiian Islands. Both were biopsied on the day of arrival. In the larger specimen, which appears to be in the size range of the other captive kawakawa, the ova appeared to be in a state of resorption. The smaller specimen, probably less than 40 cm in fork length, had small, immature ova only about 0.08-0.10 mm in diameter. Observations of personnel on the cruise indicate that many of the kawakawa dissected during the cruise had ovaries that were in advanced stages of maturation or even spent.

A marking experiment to facilitate easy identification of test fish is also being conducted on these latter two kawakawa. Silver nitrate sticks were used to mark the numerals "1" and "2" on their respective right dorsal surfaces. After 5 days, the marks were still clearly evident and legible.

Pacific and Western Pacific Portions of Billfish Fishery Management Plan to be Merged

Heeny S. H. Yuen, Leader, Recreational Fisheries Task, reviewed draft billfish fishery management plans (FMPs) prepared by Plan Development Teams of the Pacific Regional Fishery Management Council and the Western Pacific Regional Fishery Management Council (WPRFMC) to make plans to merge the two drafts. A meeting to work out the details of merging the drafts is tentatively scheduled for June 4.

Plans Made to Tag Billfishes at Billfish Tournament

The Hawaiian International Billfish Association has made plans to promote the tagging of billfishes during this year's Hawaiian International Billfish Tournament. Heeny Yuen assembled the necessary tagging equipment and supplies.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

ALBACORE FISHERIES

Papers Prepared for Albacore Workshop in Japan

Dr. M. Laurs, Leader of the Albacore Fisheries Program, has been working on two papers for the North Pacific Albacore Workshop to be held in Shimizu, Japan, during late June. This will be the fourth North Pacific Albacore Workshop held as part of a continuing informal arrangement established in 1974 between NMFS, Southwest Fisheries Center and the Far Seas Fisheries Research Laboratory, Shimizu, Japan, to promote and accelerate joint investigations into the biology, ecology and population dynamics of North Pacific albacore. One of the papers being prepared by Laurs concerns the results from albacore tagging studies in which Laurs postulates the existence of two substocks of albacore in the North Pacific. The other paper deals with results from the albacore otolith/tetracycline experiment to evaluate the validity of the assumptions of the otoliths daily ring increment method for aging albacore. Microscopic examination by Fishery Biologist R. Nishimoto of otoliths from 61 albacore tagged and injected with tetracycline and recovered after being at liberty from 1 to 400+ days shows a 1:1 relationship between rings and days of freedom after injection.

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Laurs, along with R. Evans of the Oceanic Division, also attended meetings this month with representatives from the Jet Propulsion Laboratory and Global Weather Dynamics Inc. concerning the satellite demonstration experiment to distribute ocean data products to tuna fishermen.

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Oceanographer R. Lynn reports that progress is being made on plans for the November albacore oceanography cruise during which the oceanography of the offshore Transition Zone waters will be investigated and experimental vertical longlining will be used to study the migration pattern of the southern substock of albacore as they immigrate from waters off southern California (see Monthly Report for March 1979). Dr. Kern Kenyon, Oceanographer from Scripps Institution of Oceanography, will join the survey as part of a collaborative effort. He will collect needed hydrographic stations along latitude 35° N in transit to the offshore survey area as input to a study of large scale circulation modes in the North Pacific Ocean. Additionally, he will aid in the frontal studies. After considerable negotiations, Lynn found that the anticipated participation of an SIO scientist in a study of marine chemistry about the ocean fronts lacked the adequate financial support at this time and the idea was dropped.

Preparations Continue for Use of Vertical Longlines on November Albacore Cruise

Biological Technician R. Dotson began assembling the vertical longline gear to be used on the albacore cruise in November. The longline is designed after an experimental vertical longline used by Japanese researchers in 1969 to measure the swimming depth of albacore in the Western Pacific and will be used to test for the presence of albacore in the Transition Zone of the Northeast Pacific.

Dotson traveled to the Tiburon Laboratory to confer with Sus Kato on design, equipment and techniques for the longline and to pick up some equipment to be used in its construction. Dotson and Lynn held a meeting with Milton Roll, captain of the R/V David Starr Jordan, and the bosun, Dan Kulesich, to determine the best method for deployment and retrieval of the longline from the Jordan.

Dotson has also been preparing for the 90-day cooperative AFRF-NMFS albacore tagging cruise this summer. Equipment is being designed for 1-week of sonic tracking of albacore to be done onboard the AFRF charter vessel Linda, working with the NOAA ship David Starr Jordan during the last week in July.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Annual Report Compiled on Anchovy Fishery

Data for the annual report on the anchovy fishery is being compiled by Jane McMillan, Economist, and Dr. Gary Stauffer, Fishery Biologist. Stauffer reports that the abbreviated CalCOFI egg and larva survey for 1979 was completed on May 23 with the return of the Jordan to San Diego. Four surveys over the CalCOFI pattern were conducted between January and May; however, only two of the four cruises were permitted to survey in Mexico's zone. Sorting of plankton samples will be completed by June 1 and the data verified by June 15. The anchovy biomass estimate necessary for setting the 1979-80 anchovy quota will be submitted to the Director of the Southwest Region, Gerald Howard, by the July 1 deadline. Stauffer is currently examining the historical anchovy larva time series to evaluate the potential bias arising from the partial sampling of the regions off Mexico.

McMillain has found that the landings during 1978 and 1979 were the lowest since the anchovy reduction fishery began in 1966, with landings of the 1978/79 season only one-tenth of the 1977/78 season. CF&G, fishermen organizations, the vessel owner's coop, processors and brokers throughout the state were asked about the economic and social impact of such poor landings. While everyone involved seems to suffer from loss of earnings due to the low landings, there do not seem to be any permanent repercussions. The fleet size is down somewhat from an average of about 35 boats in the past few years to an estimated 29-30 boats that will be fishing in the fall of 1979. The processing plants were able to process more tuna meal during the season. The

brokers were worried that some customers may have stopped using anchovy meal because of the erratic supply, but stated that future use is a matter of supply, demand and price.

Cannibalism in Anchovy Investigated as Mechanism of Population Regulation

One of the most obvious mechanisms of anchovy population regulation is cannibalism. Dr. John Hunter, Fishery Biologist, recently determined that anchovies in his trawl-caught samples (provided by K. Mais of CF&G) had consumed anchovy eggs at about one-half the rate at which they were produced. This level of cannibalism could be a significant regulatory mechanism over the long-term. Many other factors influence larval survival, resulting in large, short-term fluctuation about a long-term trend.

A model of cannibalism resulting from indiscriminate filter-feeding was developed to help determine the amount of density-dependent regulation which would result from cannibalism. Adult anchovies can filter three liters per minute, and behaviorally tend to "hunt down" patches of eggs, thus increasing their efficiency. On the one hand, the number of larvae surviving to first feeding will tend to increase with adult spawning biomass, as more eggs will be produced. On the other hand, those same adults consume their eggs and larvae for several days following spawning, decreasing effective production of offspring. The resulting relationship between spawners and effective larva production is essentially a "Ricker" curve, with peak effective larva production at intermediate population sizes. Peak production occurs when a volume of water equal to the volume inhabited is filtered by the spawning population during the time from spawning to first feeding by larvae. Optimum biomass is approximately 300 tons per square mile, or about 100,000 tons per 20-minute grid used by sea surveys. This density is similar to the highest densities usually encountered by sea surveys, suggesting that the anchovy population may tend to be limited more by production of eggs than by cannibalism. Nevertheless, cannibalism can provide sufficient density dependent feedback so that the spawner-recruit relationship is curved.

Jack Mackerel Plan Regulatory Analysis Completed

Economist J. McMillan completed the regulatory analysis based on the third draft of the Jack Mackerel Fishery Management Plan (FMP). Regulatory analyses are required for all government regulations that may have an economic impact, and serve to analyze the economic impacts of alternative fishery management measures. McMillan determined that there would not be any adverse impact on prices, supply, employment, productivity, or market structure as a result of implementation of any of the management options of the jack mackerel FMP.

Daily Growth Increments in Otoliths of Juvenile Anchovy Counted to Determine Birthdate Distribution of 1978 Clan

R. Methot graduate student from Scripps Institution of Oceanography, reported that juvenile anchovy were collected from the live-bait fishery with a midwater trawl between September 1978 and May 1979, in order to count daily growth increments in the otoliths of some of these fish. The objective of the research is to determine the birthdate distribution of the 1978 year class. Since a large number of specimens are available (66 samples, 15 fish per sample), the size distribution of fish in these samples was analyzed to guide the selection of fish for age determination.

Samples from the live-bait fishery, September 1978 to December 1978, contained three size modes centered at 76 mm, 90 mm and 105 mm. From Santa Monica Bay to San Diego, fish with lengths near the first mode were abundant; the second mode was nearly obscured and the third was barely represented. From Pt. Hueneme to Avila Beach the overall abundance of fish was lower and the three modes were represented about equally. Fish of the first mode were born in March-April 1978; second mode, December 1977, third mode, presumably in early 1977.

Samples collected from the live-bait fishery in January-March 1979 showed no latitudinal trend in the distribution of fish size. The data suggest size modes at 66, 81 and 98 mm. The birthdates associated with fish from the first two modes are early summer and March-April, respectively.

In the offshore trawling surveys, the minimum and mean size was greater than in the inshore bait fishery and no size modes were apparent. In the January-February 1979 survey, only one fish less than 87 mm was collected. In the April survey, only one fish less than 95 mm was collected. No otoliths from trawl-caught fish have been analyzed yet.

Work Continues on Effect of Solar UV on Survival and Growth of Anchovy Larval

Dr. J. Hunter reported that work continued on the effect of solar UV-B on the survival and growth of larval anchovy conducted on the roof of the Southwest Fisheries Center. For reasons as yet unknown, survival of larvae in Mylar controls in the rooftop apparatus was usually less than that of larvae reared in the aquarium. This effect may be caused by the difficulty of rearing larvae in a less controlled outside environment, or by effects of radiation other than solar UV-B (photodynamic effects). Regardless of the overall lower survival in rooftop experiments, survival of larvae exposed to solar UV-B was consistently lower than that of the rooftop controls and was inversely proportional to solar UV-B dosage. The work also indicates that survival under solar UV radiation was somewhat less than that occurring at the same DNA-weighted UV-B dose in the aquarium. This could be caused by the lower control survival described above, or could be the result of a failure of the DNA weighting technique to approximate the actions spectrum for radiation-induced damage. All of these possible effects are under study.

An important conclusion can be drawn from these preliminary results. The high sensitivity of larval anchovy to UV-B radiation, based on experiments employing artificial sources of UV-B, is now confirmed using natural UV-B radiation. Indeed, their solar studies indicate that the sensitivity of larvae to solar UV-B is the same or greater than that predicted from the aquarium experiments.

Photoreactivation studies were begun this quarter using the aquarium apparatus and artificial sources of UV-B. In all past aquarium work, a 6-hour UV exposure was used centered in the 12-hour day. In the photoreactivation experiments the period of UV-B exposure was shifted from the center to the last 6 hours of the day in the 11-day exposure, and either the first or last 6 hours in the 4-day exposure. If photoreactive repair mechanisms exist, one would expect survival to be higher when the UV period occurred during the first 6 hours and lower than past work when it occurred in the last 6 hours of the day.

Results of 11-day exposure experiments (dose=45-71 $(J \cdot m^{-2})_{DNA\ eff.}$ $(day)^{-1}$. indicated that shifting the exposure period to the last 6 hours of the day did not decrease survival, survival was essentially the same as when larvae were exposed to a UV-B period in the middle of the day. On the other hand, survival in the 4-day experiments conducted at a substantially higher dose rate (172-278 $(J \cdot m^{-2})_{DNA\ eff.}(day)^{-1}$) clearly demonstrated the existence of photoreactive repair. Survival was lower when exposure occurred at the end of the day and higher when it occurred during the first 6 hours. The most tenable explanation for these results is that at low dosage rates used in 12-day exposure experiments, the rate of photoreactive repair kept up with the rate of reparative damage, consequently a shift of the exposure period to the end of the day did not increase mortality. On the other hand, at the high dosage rates used in the 4-day experiments, repair did not keep up with rate of UV damage and consequently shifting the period of exposure altered survival. An implication of this hypothesis is that mortality at the low dosage rate used in the 12-day experiment was the result of damage not reparable by photoreactivation.

Table 1. Effect of shifting the 6-hour UV-B exposure period[1] to the first or last half of 12-hour day compared to experiments where it was centered in the day.

11-DAY EXPOSURE[2]

Total Dose	UV Exposure Period		Percent Survival	
$(J \cdot m^{-2})_{DNA\ Eff.}$	First 6 hours	Last 6 hours	Observed	Expected from UV period centered in the day[3]
498		X	86	78
689		X	69	47
571		X	79	66
786		X	63	34
571		X	79	66
786		X	67	34

4-DAY EXPOSURE

1112	X		79.4	53
1112		X	41.0	53
989	X		62.6	67
989		X	29.6	67
690	X		94.4	92
690		X	39.6	92

[1] UV source = FS40 lamps and CTA.

[2] Duration of experiments was 12 days but no UV dose was given on the first half of initial and final day of experiment.

[3] Based on regression survival probit on log dose for experiment, illustrated in Fig. 1, for 12-day exposure and that given in Hunter et al. (1979: Photochem Photobiol.29: 325-328) for a 4-day exposure.

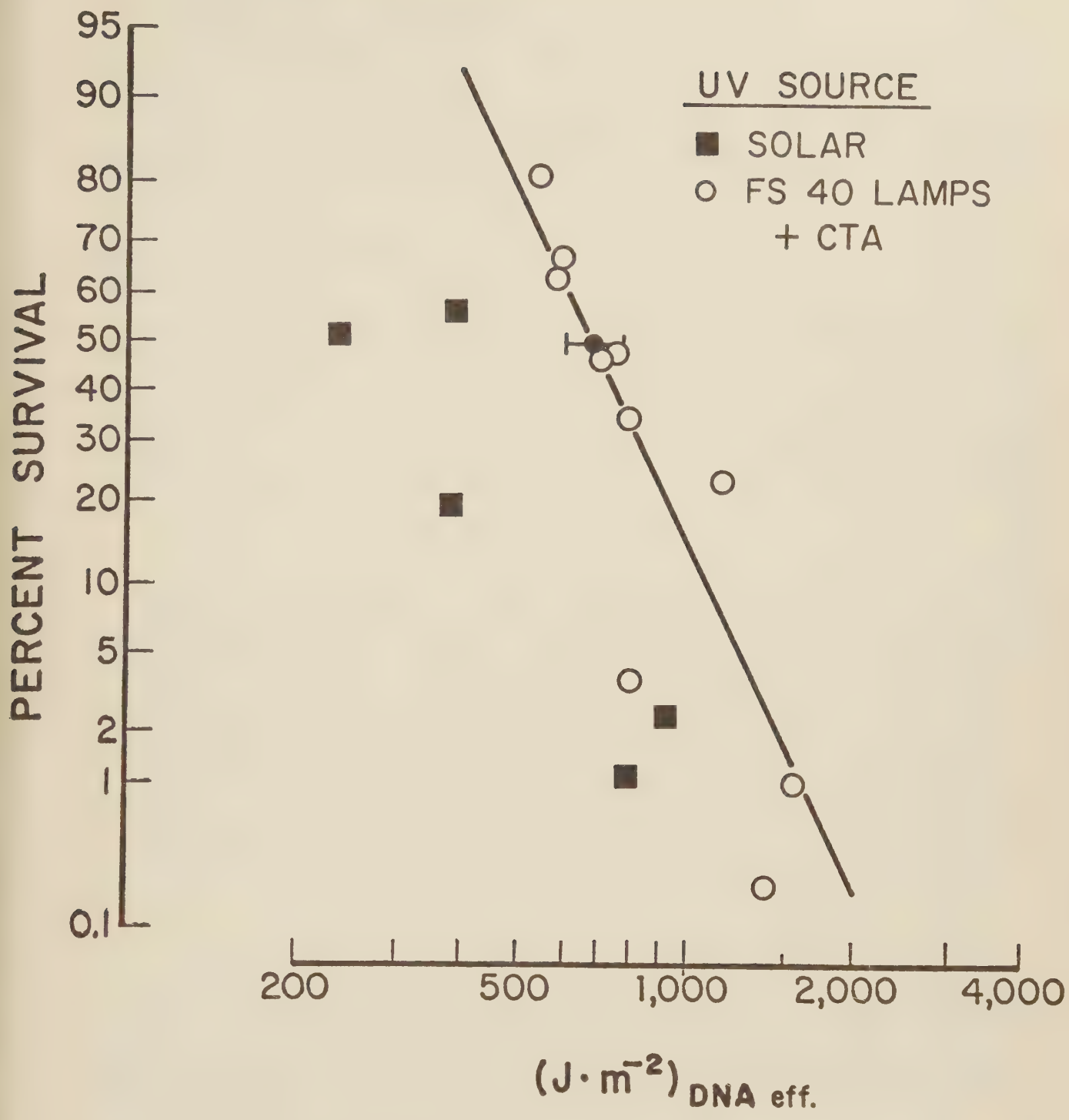

Figure 1. Percent survival of anchovy larvae as a function of total cumulative dose of UV-B, weighted by DNA action spectrum of Setlow (1974) using the analytical fit of Green and Miller (1975). Open circles (means for experiments) and regression line for a 12-day exposure to FS-40 lamps filtered by CTA. Solid squares are mean survival for larvae exposed to solar UV-B (290-320 nm) for 11 days.

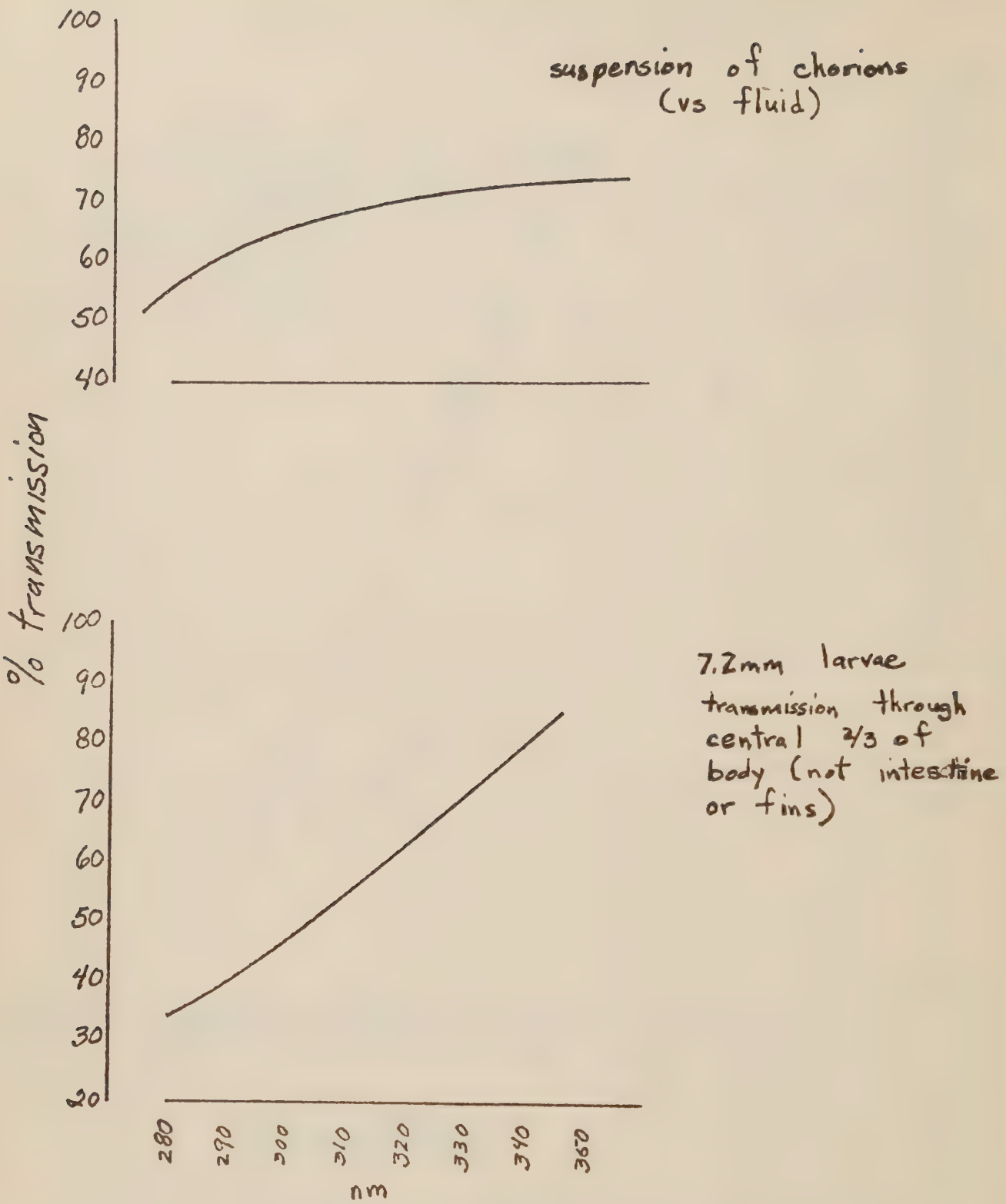

Figure 2. Spectral transmission of a suspension of anchovy chorions (upper graph) and that of a 7.2 mm anchovy larvae (lower graph). Measurements made with a Beckman D.B. spectrophotometer.

Programming Developed for Free-Fall Particle Counter

There was additional testing of Dr. Lasker's free-fall particle counter (FFPC) on the R/V Jordan in the Los Angeles Bight this month. Ken Bliss, Joe Caruso and Jack Brown provided the programming routine for transfer of FFPC data from its dedicated computer, fabricated by Jack Brown, to a Hewlett Packard 9825 tape and then to an automatic graphical output of data showing a vertical profile of larval anchovy food particles, by size, with depth. Dr. Lasker intends to survey the anchovy spawning grounds with the FFPC to detect best areas for larval anchovy feeding.

Center Scientists Represented in Workshop Proceedings on Climate and Fisheries

The proceedings from a workshop held March 29-31, 1978 by the Center for Ocean Management Studies, University of Rhode Island, was published this month and titled, "Climate and Fisheries." Drs. Lasker and R. Parrish of the Pacific Environmental Group each wrote a case study for the publication. Dr. Lasker's paper was titled, "The effect of weather and other environmental variables upon larval fish survival leading to recruitment of the northern anchovy," Dr. Parrish's article was titled, "Climatic variation and the Pacific mackerel fishery."

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Dr. R. Lasker, Leader of the Coastal Fisheries Division, attended an Ocean Sciences Board-sponsored meeting on fisheries science held at Princeton University on May 14-15. Chairing the meeting was Dr. John Steele, Director of Woods Hole Oceanographic Institution. Attending the meeting, along with Lasker and Steele, were Brian Rothschild of NOAA (former Director of the Southwest Fisheries Center), Erik Ursin of Denmark, Colin Clark of University of British Columbia, Robert May of Princeton University, Warren Wooster of University of Washington, John Walsh of Brookhaven National Laboratory, and Richard Vetter of the National Academy of Sciences. The main conclusion of the meeting was that factors affecting recruitment and fish mortality rates are virtually unknown and constitute a major stumbling block to advancement in fisheries science. A report of the meeting is being prepared by Steele.

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Dr. Daniel Weihs, NOAA Post-Doctoral Research Fellow, has completed revisions of a paper entitled, "Respiration and depth-control as possible reasons for swimming of yolk-sac larval anchovy" (see Monthly Report for March 1979) after review of the original manuscript by Fishery Bulletin. He also completed a manuscript entitled, "Hydrodynamics of suction feeding of fish in motion," which deals with suction feeding by means of a mathematical model (see Monthly Report for February 1979).

MARINE MAMMAL BIOLOGY AND TECHNOLOGY PROGRAM

Workshop Held on Effects of Chase and Capture on Porpoise

A workshop on the physiological and pathological effects of chase and capture on porpoise was held at the Center on May 1-3, 1979. The workshop was convened to examine the potential for mortality in porpoise that have been released, apparently unharmed, from purse seines during the course of yellowfin tuna (Thunnus albacares) fishing operations. The potential for such mortality was recognized during research into the causes of "passive behavior" in spotted porpoise (Stenella attenuata). Porpoise exhibiting passive behavior are observed lying on the bottom of the purse seine during the latter portions of the set, shortly before they are to be released from the seine. Passive animals often lie on the webbing on their backs and in some instances are observed to arch their backs so that the head and tails are raised dorsally. The animals appear alert, i.e., the eyes are moving and apparently observing what is going on about them, but they can be approached and touched easily. When they attempt to swim to the surface, their swimming actions are awkward. These symptoms could be considered equivalent to the behavior of terrestrial ungulates that are affected by a syndrome called "capture myopathy." The behavior of animals with capture myopathy often indicates that they have stiff and sore muscles. In more severe cases recumbency occurs, but the animal is alert. In these cases it is often possible to approach and handle the animals without the animal trying to escape. The workshop participants suggested that it might be wise not to restrict the discussion to "capture myopathy" as the term myopathy implies muscle damage and, given the little that is known of porpoise physiology, a broader approach would be advisable.

Workshop participants were selected from a broad range of experiences and from as far away as South Africa to deal with this problem. The conclusions were as follows: (1) It is probable that some presently unobserved mortality is occurring as a result of stresses induced by the chase and capture of porpoise. (2) The presently available data are insufficient to quantify the rate of the unobserved mortality. (3) More research is necessary on this subject. Dr. Warren Stuntz, Fishery Biologist and Workshop Convenor, is presently preparing a report on the workshop.

Cooperative Gear Research Begins on Dall's Porpoise Gillnet Problem

James Coe, Fishery Biologist, is participating in research on the gear aspects of the Japanese salmon gillnet fishery. This fishery, much of it conducted inside of the U.S. 200 mile fishery zone in the Aleutian area, has an incidental take of Dall's porpoises. The U.S. and Japan have launched a cooperative research effort into ways of reducing the incidental take of Dall's porpoises. The U.S. portion of this program is operating out of the

Northwest & Alaska Fisheries Center in Seattle. Coe traveled to Japan this month to take part in a research cruise aboard a Japanese salmon gillnet ship along with personnel from the NWAFC. For this cruise, much of the scientists' activity was simply to observe the operations so that reasonable experiments and approaches can be developed for the solution of this problem. The NMFS scientists will return in late June 1979.

Cooperative Gear Research Cruise Departs

The first of three NMFS-industry cooperative gear technician cruises departed May 19, 1979. Gene Anderson, Biological Technician, is accompanying the tuna seiner, Cabrillo, on the first of two scheduled trips. The purpose of this effort is to study the effectiveness of deepening a purse seine to combat the problem of net collapse and associated porpoise mortality. Delay-causing circumstances occasionally occur during purse seine sets that halt the pursing and net retrieval processes. When such delays occur, the surface area available to porpoises within the corkline perimeter is reduced proportionally with the duration of the delay. Occasionally a complete collapse of the net occurs when such delays continue for a long period. Net collapse contributes significantly to incidental porpoise mortality in tuna purse seining. This research is directed at decreasing this mortality by increasing the surface area available in the purse seine and thus increasing the time available to solve delay-causing problems. During the current trip, Anderson will make measurements of the net surface area and will use bathykymographs to measure sinking rates, pursing depths, and other parameters of importance in evaluating a seiner's operation. When the ship returns, the net will be deepened by two additional strips of webbing. A NMFS technician is scheduled to accompany the vessel on the following trip to measure the results of deepening the net.

MARINE MAMMAL ASSESSMENT AND MONITORING PROGRAM

Weekly Estimates of Porpoise Kill Continued

Estimated mortality of porpoise in the ETP (east of 150° W) through May 20, 1979 totaled 9,055 animals for stocks which have a non-zero allowable mortality quota during 1979. For a comparable period in 1978, estimated mortality was 3,321. Cumulative kill-per-set porpoise set for 1978 (2.31) and for 1979 (2.71) are not much different, and cumulative kill-per-ton of yellowfin tuna caught on porpoise for 1978 (0.23) and for 1979 (0.24) remain nearly equal. However, the cumulative kill-per-day rate for 1979 (1.15) is 2.6 times the number in 1978 (0.44). Prohibitions against further sets on northern striped dolphins, northern common, and central and southern common dolphins have been in effect since April 12, April 19 and May 16, respectively.

Preparation Started for Porpoise
Stock Assessment Workshop

A general staff meeting was held April 30 at which Dr. Joseph Powers, Leader of the Marine Mammal Assessment and Monitoring Program, outlined the schedule for reassessing the porpoise populations. This task is required

under the Marine Mammal Protection Act, and the results will be used in determining proposed Federal quotas on porpoise mortality during the 1981-1983 fishing seasons.

Dr. Nancy Lo has been reviewing the data and methods used in determining porpoise mortality for the years 1959-1970. Additional data sources have been reviewed and all back calculations are being redone.

Mathematician Bruce Wahlen has been reviewing the differences in school size estimates that exist between crew members aboard tuna vessels and government observers. This work was originally done under contract with Mr. E. Braizer.

Dr. Tim Smith assisted by Tom Polacheck are continuing their detailed analyses into the historical abundance estimators of porpoise population.

Drs. Joseph Powers and Rennie Holt have begun analysis of the 1979 aerial survey data. A preliminary summary of the survey will be reviewed at a workshop to be held in mid-June at the Center.

Aerial Survey Team Returns

The scientific party conducting a survey of the porpoise populations in the eastern Pacific returned to San Diego aboard the chartered PBY Catalina on April 25. Twenty of the planned twenty-four flights were completed and more than 15,000 nautical miles of ocean surveyed. A total of 387 marine mammal sightings were recorded. Lt.Cdr. Wayne Perryman of the NOAA Corps obtained excellent photographs of porpoise schools. He expects to get accurate counts from 12 different schools to compare with observer estimates. Lt. Terry Jackson of the NOAA Corps and chief scientist in charge of the operation is preparing a complete report of the survey activities and results.

Documentation of 1979 Porpoise Observer Data Editing Programs Continues

Work continues on documentation of the 1979 Porpoise Observer Data Editing programs. Internal documentation has been accepted on three of the six main edit programs (BRIDGE LOG EDIT for 1975-1976 and 1977-1979 and the SET LOG EDIT for 1979) completed by Roger Grismore of PRI, a contractor. Four of fourteen COMMON subroutines produced by Computer Programmer Robert Butler are under review. Additional documentation on eight sequencing programs and a SORT program are to be forthcoming. All programs are currently being used to edit incoming observer data.

Last month the data editing group checked in 11 cruises from technicians participating in the Southwest Regional Observer Program. Many of these cruises were three to four months duration. This brings the number of cruises checked in to date in 1979 to 31, with about 20 regional observers currently at sea. Processing of these data is proceeding well according to Charles Oliver and Frank Ralston at the La Jolla Laboratory, who supervise data editing and management.

Scientists Participate in 30th Tuna Conference

The 30th Annual Tuna Conference was held at the University of California Regional Conference Center, Lake Arrowhead, California, on May 13-16. Chairman Dr. Gary Sakagawa, Chief of the Oceanic Fisheries Resources Division, organized the Conference around the theme, "Unit stock management of highly migratory species--Is it an imperative?"

The conference consisted of three sessions. Session I included presentation of 6 papers on "Stock Identification Techniques," including the use of tagging, biochemistry, parasites, and X-ray spectrometry in identifying highly migratory stocks. Session II covered the "Status and Potential Yield from Tuna Stocks: with 7 papers presented evaluating the status of sailfish, marlin, bluefin tuna and tropical tunas. Session III consisted of panelists Dr. James Joseph, IATTC Director of Investigation; Harold F. Cary, General Manager, U.S. Tuna Foundation; John D. Negroponte, Ambassador and Deputy Assistant Secretary for Ocean and Fisheries Affairs, U.S. State Department; and Frank Alverson of Living Marine Resources, Inc., San Diego, discussing "Management and the Unit Stock Concept."

Fishery Biologist Ronald G. Rinaldo at the La Jolla Laboratory presented a paper titled, "Statistics on world tuna stocks and fisheries with U.S. participation" in Session II. The presentation covered distribution, catch, recent fishing trends, estimated yields, and current management effort for the six principal tuna species; skipjack tuna, yellowfin tuna, albacore, bigeye tuna, bluefin tuna, and southern bluefin tuna. Each species was reviewed by geographic area ('stock') in the Atlantic and Pacific Oceans, with a report on the level of U.S. catch in each of the area's fisheries.

Unit stock management was explored in Session III as the panelists related their own experiences and ideas to the topics. Scientific, industrial and political concepts were focused on the practical aspects of managing the highly migratory tunas and billfishes. Panelists cited historical instances to support their ideas as well as current eastern tropical Pacific negotiations and events. Conference participants became involved with the panel in an active discussion session following the presentations.

Review Completed Summarizing 1978 Puerto Rico Sampling Program

Biological Technician Eugene Holzapfel, during a recent visit to the La Jolla Laboratory, completed a review summarizing the 1978 sampling of foreign transshipments of Atlantic tunas landed in Puerto Rico. The 1978 Puerto Rico sampling program resulted in a total of 196 length-frequency samples (10,368) taken from the transshipped catches of American, Netherlands Antilles, Japanese, Korean, Ghanaian, Panamanian, French and Spanish flagged purse seiners, baitboats and longliners. The percentage of the total Atlantic imported tuna catch sampled for length-frequency was 22% in 1978 compared to 11% in 1977. Most length-frequency samples were from catches of tropical

tunas, yellowfin, skipjack and bigeye. Analyses of these length-frequency samples indicate that the dominate modal lengths for all species have decreased since 1977. Yellowfin tuna showed the greatest decrease in dominant modal length from 56 cm in 1977 to 48 cm in 1978.

In 1978, 81 samples collected for determination of species composition were taken from the transshipped catches of yellowfin and bigeye tunas in order to assess the extent of misreporting of these species. Analyses of these samples indicate that 28% of the reported yellowfin/bigeye tonnage is actually bigeye tuna. Length and weights of 97 yellowfin tuna, 54 skipjack tuna and 82 bigeye tuna, including otolith samples from large skipjack tuna, were taken in 1978.

Tuna Vessels Continue Participation in FAX Advisory Program

During April 1979, 26 tuna seiners and 1 research vessel contributed synoptic weather data to the NMFS FAX Advisory Program at the La Jolla Laboratory. A total of 222 weather and 5 XBT observations were reported via NMFS-licensed radio station WWD. The table below lists data pertaining to program participation during April 1978 and 1979. The numbers of total observations and boats reporting are higher than in April 1978.

	APRIL	
	1978	1979
Number of vessels with equipment	54	48
Number of vessels reporting	20	27
Number of weather observations reported	131	222
Number of XBT observations reported	23	5
Total Observations	154	227

Leading all program participants this month is Captain John Gomes and the crew of the tuna seiner, Santa Rosa, with 25 weather and 5 XBT observations. NMFS thanks go to Captain Gomes and crew and all other contributors to the FAX program for their help and cooperation.

Fishermen to Participate in Cooperative Swordfish Sampling Program

A swordfish sampling program began early in May with distribution of sampling kits to cooperating commercial harpoon fishermen. These kits contain materials necessary for collecting swordfish gonads and length-weight data that will be used in a study of the reproductive biology of swordfish in California waters, according to Earl Weber, Fishery Biologist, who is in charge of the project. The purpose of the study is to determine how the seasonal migration of swordfish into the California Bight is related to their sexual cycle. To date, four fishermen have received kits and more will be distributed before the anticipated heavy fishing begins in June.

PACIFIC ENVIRONMENTAL GROUP

OCEAN CLIMATOLOGY AND MONITORING

Panel Recommends Highest Priority to Efforts for Updating Surface Marine Weather Observations

Dr. Douglas R. McLain of the Pacific Environmental Group attended a data management workshop May 8-11, 1979 at Harper's Ferry, West Virginia for the National Climate Program. The objectives of the workshop were to define major climatic data sets and to find ways to improve inventories and means of accessing the data. McLain served on the Ocean Data Panel of the workshop, which gave primary emphasis to the climatic uses of surface marine weather observations from merchant ships and to subsurface observations such as those from XBT's and hydrographic station casts. Of lesser importance for climatic purposes are other data sets such as satellite ocean observations, fisheries data, bathymetry and sea level data. The panel recommended that highest priority be given to efforts for updating and organizing surface marine weather observations and analyzing such data for use in climate models, particularly dealing with exchange of moisture, energy, and momentum between the oceans and atmosphere.

FISHERY ENVIRONMENTAL MODELING AND FORECASTING

Dr. Dick Parrish traveled to Rome, Italy this month to discuss an FAO contract involving the use of large-scale environmental data in fisheries research, fishery models, and fisheries management. This work is part of a FAO project which is attempting to merge available knowledge of large and small-scale oceanography with large and small-scale biological knowledge of larval fishes. While in Rome, Dr. Parrish presented four lectures at a joint FAO-Italian sponsored training course on The Application of Remote Sensing to Fisheries. The lectures covered the oceanic climatology of the California Current Region, larval transport and reproductive strategies, use of environmental data in fisheries management, and remote sensing applications in the California Current Region.

FISH COMMUNITIES INVESTIGATION

Properties of Feeding Selectivity Indices in Rock Wrasse Examined

The degree of selectivity that a predator demonstrates toward a prey item category is a critical factor in any feeding study. Several measures have been proposed to measure this selectivity These include the forage ratio ($^{r}/p$), electivity index ($\frac{r-p}{r+p}$), Jacob's mortality index ($\frac{r-p}{r+p-2pr}$), and the standardized forage ratio, where r = the percent of a prey item in the ration, and p = the percent of a prey item in the environment. Pete Adams, Operations Research Analyst at the Tiburon Laboratory, evaluated these indices using feeding data collected by Dr. Edmund S. Hobson and Tony Chess on the rock wrasse (Halichoeres semicinctus) from the Catalina kelp forest. The forest community analysis indicates that, even though there was a large component of inherent variation in both the feeding data and the environmental data, all of the indices show similar trends in selectivity. The standardized forage ratio has the advantage of being unaffected by the inclusion or removal of unconsumed prey categories from the environmental data, which is often a problem in working with field data. There are other minor differences in the indices that would be important in more controlled experimental conditions. The interesting thing is that the variation in the selectivity of the rock wrasse from collection to collection, though high, was slightly lower than the variation in stomach contents. Coefficients of variation of selectivity indices ranged from 10 percent to 105 percent (Mean = 86%) while coefficients of variation from the stomach contents ranged from 25 percent to 130 percent (X = 93%).

FISHERIES DEVELOPMENT INVESTIGATION

Fishery for Shortbelly Rockfish Gets Underway

Lt. Patrick Rutten, NOAA Corps, and Fishery Biologist Sus Kato participated in the first commercial fishing attempts to catch and market shortbelly rockfish on May 10-12, 1979. This species is the most abundant rockfish in the California Current, and is the object of fishery development efforts at the Tiburon Laboratory. The fishing vessels Merluccius and Charmaine, based at Fort Bragg, used the Laboratory's Polish rope midwater pair-trawl, and fished about 40 miles southeast of San Francisco. Only four trawl tows were attempted because of rough weather, and also because immediate objectives of the trip were attained. Two tows resulted in no catch, but one tow produced 12,000 pounds of shortbelly rockfish with virtually no by-catch, and another tow resulted in a catch of about 35,000 pounds of Pacific hake and 5,000 pounds of rockfish. Average size of the shortbelly rockfish (25 cm) was greater than that of fish taken in previous research cruises.

The fish were stored on board in refrigerated sea water which unfortunately had been cooled to only 40° F when the fish were caught.

Most of the catch of shortbelly rockfish were landed at Fort Bragg and shipped to two buyers in Southern California. A thousand pounds were taken to the Tiburon Laboratory for sampling and processing. About 600 pounds of headed and gutted fish were transported to Bayou La Batre, Alabama, for trial processing into material for Japanese-style minced fish cake (surimi). A commercial operation there, "Nichibei Fisheries," is the only producer of surimi in the United States. Fish cake made from minced shortbelly had good flavor and acceptable color, but in all-important criteria of elasticity and cohesiveness of flesh, shortbelly failed miserably, the resultant fish cakes crumbled under moderate pressure.

Since all other rockfish tested produced good surimi, it is possible that one or two factors may have contributed to the poor results: 1) On-board preservation was not adequate, or 2) the physiological state of the (post spawning) fish affected the essential characteristics of the flesh. Regarding the latter, Japanese workers report that flesh of many fishes make poor surimi soon after spawning while they make excellent surimi during other reproductive stages.

Needless to say, further tests will be conducted along this line. In the meantime, the best possible routes of development of the fishery appears to be the pet food market, or as fresh or frozen fish.

Studies Continue to Validate Elasmobranch Aging Techniques

During May, Fishery Biologist Susan Smith of the Tiburon Laboratory obtained 11 additional sharks for the tank experiment phase of her shark aging study. Smith is experimenting with the UV-fluorescing compound oxytetracycline hydrochloride (OTC) to determine the minimum dose required to make a well-defined "time mark" in the vertebral centra--the structures most often used in elasmobranch aging. She is trying to find a dose sufficient to be taken up in calcified and calcifying parts but not taken up and stored in the liver. Once the minimum dose is determined, elasmobranchii will be tagged and injected with OTC in the field.

Seven brown smoothhounds (*Mustelus henlei*) and four leopard sharks (*Triakis semifasciata*) were injected this month with OTC. In some OTC was combined with the tissue penetrating agent dimethylsulfoxide (DMSO) to determine if DMSO enhances uptake of very small doses of OTC. These tank-held fish will be sampled and examined at the end of June.

Two adult brown smoothhounds injected April 27 were sampled on May 29. Preliminary gross examination of the calcified parts and liver showed varying degrees of OTC uptake. In the smooth hound that had been injected with a dose of 50 mg/kilogram of body weight, fluorescence was detected on the teeth as well as on the outer ring of the centra, and there was a faint yellow fluorescent sheen over the liver. The other fish which had been injected with 25 mg/kilogram of body weight showed faint fluorescence on the teeth only. The centra of both fish will be prepared, sectioned, and examined more closely under magnification and UV illumination.

Also, six term pups were obtained from one of the sampled female Mustelus, and the same day, another tank-held Mustelus gave birth to four pups. Because of the known birth date and its use in determining daily ring formation, attempts will be made to maintain the pups in aquaria for an extended period of time.

Recreational Fisheries Improvement

Roger Green, Leader of the Recreational Improvement Subtask, reports that the king salmon being reared for the Tiburon Laboratory at the Feather River Hatchery have been experiencing good growth, doubling in weight in approximately 20 days. At month's end, the fish are approximately 160 per pound, or 2.8 g. Green and Daniel Ralph, Fishery Biologist, traveled to the hatchery in May to service the chemical imprinting system.

Green also reports that the first tag return of the year was received this month from one of the king salmon tagged in 1976. The 12-pound fish was caught off Eureka, California by a commercial troller.

PHYSIOLOGY INVESTIGATION

Samples of Striped Bass Show Poor Condition

Studies of effects of chronic pollutants on striped bass during spawning migration are being continued by Dr. Jeannette A. Whipple and staff. Samples of pre-spawning and spawning adults collected from both the San Joaquin and Sacramento Rivers show that females appear to be in even poorer condition than last year with a high number bearing body lesions, heavy parasitic loads, and abnormal ovaries with dead gametes. Autopsies and subsampling of tissues for measurement of pollutant concentrations of aromatic petroleum hydrocarbons, heavy metals, and other classes of pollutants is being conducted.

The first hermaphoroditic specimen of striped bass (one in a total sample to date of 240 fish) was collected from the Sacramento River this month. This adult contained a single right ovary and a left ovary combined with a ventrally attached testis. Both male and female gonads appeared to have undergone maturation of gametes.

X-rays of a few adult pre-spawning striped bass were made transversely through fish in 5-13 mm sections with contrast enhanced axial tomography. These scans clearly showed areas of abnormal tissue and organ structure and location of necrotic areas. Some tumors may also be present, but await verification with further analyses.

A complete photographic record of the autopsy procedure has been made, including color photos of abnormalities, parasites, lesions, and variation in the egg colors.

Laboratory experiments on uptake, retention, and depuration of ^{14}C-benzene, and effects of benzene in pre-spawning striped bass have been initiated by Nina Hirsch under contract to San Francisco State. Benzene also occurs in tissues of field-captured striped bass and may contribute to some of the effects seen in this stage.

Research Findings on Striped Bass Presented to California Water Resources Control Board

On May 7, 1979, Dr. Whipple gave a presentation on striped bass research to the State of California Water Resources Control Board in Sacramento on findings of last year's studies and plans for the current year. Apparently this presentation has generated significant interest among attendees since the Tiburon Laboratory has received numerous inquiries regarding our research. Also, as a result of the May 7 meeting in Sacramento, the State of California may be able to assist Tiburon in their research by assigning at least two individuals to work with the Physiology staff and to be trained to perform the autopsies and conduct sampling of striped bass in the off-spawning season.

Dr. Whipple reviewed the following: 1) Water quality criteria methodology analyses, 2) Benzene EPA criteria, 3) the 301 Clean Water Act Technical Support Document, and 4) the EPA Effluent Guidelines and Standards for Oil and Gas Extraction Point Sources.

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Dr. Whipple has been appointed to a steering committee of five members to plan an AAAS Symposium at AAAS meetings to be held at the University of California, Davis, in June of 1980. The symposium will be centered around problems involving utilization of an urban estuary such as San Francisco Bay.

Striped Bass Eggs and Larvae Subjects of Experiments on Bioenergetics and Pollution Responses

Fishery Biologist Maxwell Eldridge at the Tiburon Laboratory reports that two spawnings of striped bass took place in May at the State-operated Central Valleys hatchery. The newly-fertilized eggs were transported to the aquarium at the Tiburon Laboratory and the resulting larvae used for a series of experiments to obtain information on the early life stages of striped bass and the effects of chronic exposure to benezene and other pollutants.

Eggs and larvae of the first spawning were found to be generally weak exhibiting low survival and growth rates. It was found that the degree of survival to hatching could largely be determined by microscopic examination of the eggs approximately four hours after fertilization. Eggs which were developing abnormally at that time died later--12-24 hours after fertilization. Larvae suffered another high mortality two to three days after hatching. Detailed water analyses showed no causes for such an occurrence. The small sizes of the larvae and the low survival support our hypothesis which we have developed from previous experiments that inherent factors provided by the parents play a major role in the viability and growth of the embryos and larvae.

In another spawning, eggs and larvae are being exposed to low chronic concentrations (100 ppb) of benzene, an aromatic hydrocarbon of crude oil and petroleum products. Embryos responded to exposure with significantly higher mortality 12-24 hours after fertilization. Benzene also advanced hatching time approximately two to four hours. The newly hatched larvae of exposed eggs, however, showed higher mortality than controls, were generally less active, and displayed less pigment development. These exposures are being continued on the prefeeding and feeding larvae. Measurements of uptake, accumulation and depuration of ^{14}C-labeled benzene and its effects on survival, development (growth and differentiation) and metabolism are being made on all the early life stages to metamorphosis.

SOUTHWEST REGIONAL DATA MANAGEMENT & ADP OPERATIONS

Southwest Automatic Data Processing (ADP) Requirements Study Is Underway

Data Systems Manager Fred Kellenberger reports that the Southwest ADP Requirements Study started in May. The requirements study group will recommend how the SWFC and SWR should operate for the next five years in the area of data processing. A meeting was held on May 7 with Rick Maire, DOC, and Margo Kelly, NOAA, to clarify topics of the study. A questionnaire on computer requirements has been developed and sent to task leaders, which will be used to determine present and future computer requirements for the SWFC and Southwest Region.

Steering Committee Formed to Oversee ORION Project

On May 1, 1979 a meeting was held with various users of the Oceanographic Research Interactive Onboard Computer (ORION) system at the La Jolla Laboratory to discuss programs and establish priorities for the R/V David Starr Jordan ORION project. It was decided at this meeting that the periodic sensor data collection application be included in the July 29 - August 4 cruise of the David Starr Jordan cruise. A steering committee has now been formed to oversee the progress of the ORION project. Members are: Dick Evans, Lloyd Farrar, Mike Laurs, Milton Roll, Paul Smith, Mark Sullivan and Fred Kellenberger. The committee has approved the specification for CalCOFI-type-cruise applications and is currently reviewing the specifications for periodic sensor data collection during non-CalCOFI cruises. Programming is continuing for the July 29, 1979 cruise.

Conversion of Financial Reporting System (FRS) to Honeywell Computer System Underway

The conversion of FRS to run on the SEFC Honeywell 66/80 computer system, and the programming of FRS additions for the NEFC, continued during May. The FRS gives financial managers and task leaders financial information on the various task plans.

The incorporation of the NEFC Encumbrance data base was coded, tested and implemented, and is available for use. This feature allows the entry of annual encumbrances and provides for the automatic reduction of the encumbered amount as commitments are entered during the year.

Also, the NEFC Personnel Master data base has been declared and is awaiting input. A program is being coded to use the Personnel data base as input to the labor data bases of FRS.

The conversion for the SEFC is being speeded up by on-site assistance from the Southeast. This involves the contractor traveling to Panama City, Florida for the week of May 28 thru June 2.

Summary Tables Completed for Analysis of 1979 Anchovy Biomass

Dorothy Roll, Computer Systems Analyst at the La Jolla Laboratory, reports that the summary tables of the 1951 through 1975 data for the analysis of the 1979 anchovy biomass was completed by Oden Burris, Computer Programmer and was submitted to Gary Stauffer. Based on these tables, Stauffer has redefined the parameters for another series of tables for the 1951 through 1975 data. Burris is recoding the selection routine to eliminate data collected during January 1 through February 15 and April 1 through April 30 and to regroup the data into three regions of the central subpopulation of anchovy (Northern, Central and Southern regions). The PRETOW program set, one to pre-edit the net tow data and the other to produce the plankton volume recording form, has been fully implemented for processing the data from the current mini-CalCOFI cruises. The internal and external documentation for PRETOW has been submitted for typing.

Other Data-Management Projects Underway

Dorothy Roll has completed the first phase of the feasibility study on computerizing time cards by submitting a report on the current manual system. The report describes the step-by-step procedures used by Valerie Spowart, Timekeeper, in recording and processing the time and attendance reports. Roll is presently reviewing the capabilities of the NBI Word Processor in terms of memory capacity, report generation and program coding power for use in the timekeeping and reporting process.

Robert Butler, Computer Programmer, produced a tape copy of program files and data files created by Australian scientists during the International Whaling Commission (IWC) conference in November 1978. The tape was sent to Dr. Geoff Kirkwood of the Commonwealth Scientific and Industrial Research Organization, Australia. A subset of the Australian program and data files was also taped and sent to Jeff Breiwick, National Marine Mammal Laboratory, Seattle, Washington.

For the Southwest Region (SWR), Robert Butler has written and tested the software package generating the weekly market news reports. This software package, a subset of the SWR Market News Data Management System, contains Continental Cannery data.

The task order to develop and implement the Billfish Data Base System was started in May. The data bases for the system will contain information describing billfish tagging information: release data, recapture data and addresses of taggers and anglers. The Task Management Plan was completed for the Billfish Data Base System after several interviews with the users, Jim Squire and Al Coan.

Several meetings were held on PACES (Pacific Area Cooperative Enforcement System) during May. PACES is ready for data entry by SWR and CF&G enforcement officials and data technicians. CF&G is scheduled to receive a data entry terminal in June and Kellenberger indicates PACES should become fully operational in June. Rosalyn Stewart, Data Technician, SWR visited the SWFC on May 28 and May 29 to receive training in the use of PACES.

Work began this month on the creation of the Coastwide Summary Data Base and the Merged Coastwide Data Files for the years 1974, 1975 and 1976. The data files will contain landings and vessel data for California, Oregon and Washington. Data tapes from Oregon and Washington were reviewed and test data was selected from them. Two programs were written and tested to merge the Vessel and Commercial Landings Files. A Manage Data Base was designed and approved by Russell Porter and Grahame King, of the Pacific Marine Fisheries Commission (PMFC). Oden Burris continues to create the California Commercial Landing tapes for 1974, 1975 and 1976 in the format required by the Coastwide Data System (CWDS). One of the requirements by CWDS is the conversion of the Fish and Game boat number to a Coast Guard or State Marine document number. To retrieve the document numbers, Burris has passed the commercial landing files against the 1978 Vessel Registration file and found 3417 vessels with no matches. Leo Pinkas, CF&G, visited the SWFC to discuss the original vessel registration forms for missing vessels. Kathy Senini, Data Transcriber, will key/verify selected data from the forms for update to the Vessel Registration file.

May 4 - Daniel Ralph conducted a tour of the Tiburon Laboratory facilities for a Fishery Biology Class from San Francisco State University.

14 - Fishery Biologist Thomas Hida of the Honolulu Laboratory provided a tour of the island for visiting dignitaries from Papua New Guinea--Charles Hooker, Minister, Department of Primary Industry, and a Staff Assistant, Roy Evara. They visited Aquatic Farms where Dr. Ed Scura (formerly with the La Jolla Laboratory's Coastal Division) briefed them on the prawn culturing operations and gave them an orientation tour of the Kahuku prawn raising facilities. They also made an unscheduled stop at the UH experimental farm and observed the experimental dairy and hog-raising operations.

22 - Daniel Ralph of the Tiburon Laboratory was guest speaker for the regular May meeting of the San Francisco Tyee Club at San Francisco. Ralph reviewed the planning and conduct of the chemical imprinting experiment being conducted on this year's king salmon to be pen-reared at Tiburon.

23 - A fifth grade class from Monterey Heights Community School in San Diego, accompanied by their teacher, Dennis Mitrovich, visited the Center for introductory remarks by L. Vlymen and viewed the Center slide presentation on research in progress. The group later visited the Fish Larval Laboratory for additional explanations of how larvae are identified by Dr. Elbert Ahlstrom and Elizabeth Stevens.

24 - Alec MacCall, Marine Biologist with the California Dept. of Fish and Game on detail to the La Jolla Laboratory, presented a lecture on the Anchovy Fishery Management Plan to Dr. Roger Revell's class on Ocean Policy Planning at the University of California, San Diego.

31 - Dr. Paul E. Smith, Fishery Biologist in the Coastal Division, lectured to students in a class entitled, "Biological Oceanographic Techniques" taught by Professor Michael Mullin at the Scripps Institution of Oceanography. Topics discussed by Smith ranged from direct sampling of the spawn, juveniles and adults to the acoustic description of the pelagic schooling fish population, the size of gas-bladder bearing fish, and the doppler spread description of swimming behavior as one clue to fish identification.

TRAINING

May 14-18 - Joe Caruso, Computer Programmer at the La Jolla Laboratory, attended a Civil Service sponsored course, "Introduction to System Analysis and Design," in San Diego.

SEMINARS

Honolulu Laboratory

May 23 - Dr. Y. Hokama, Department of Pathology, John A. Burns School of Medicine, University of Hawaii, spoke on "Ciguatoxin."

La Jolla Laboratory

May 10 - A supervisory seminar, a regular monthly feature at the Southwest Fisheries Center, was held with Chris Fee, Area Personnel Officer, presenting a talk on, "Manpower Utilization Councils (MUC) and Personal Qualifications Panel - What they are and how they function." Although primarily intended for supervisory employees, the seminars are open to all interested persons at the Center.

11 - Dr. Eric Barham, Southwest Fisheries Center, discussed, "Giant larvacean houses and other deepsea exotica." Barham illustrated his talk with motion picture films taken from deep submersibles.

22 - Mort Reid of Tricon Productions presented a film, "Two faces of the sea." This was an award-winning film depicting the life of fishermen on the U.S. East Coast.

31 - A modeling analysis of population cycles of the Dungeness crab fishery was the topic discussed by Dr. Robert McKelvey, Professor of Mathematics, University of Montana, Missoula, Montana.

Tiburon Laboratory

May 25 - The third joint seminar with San Francisco State University was held at the Tiburon Laboratory. The seminar was presented by Gail Theilacker, Fishery Biologist at the SWFC's La Jolla Laboratory and entitled, "Historical and morphological methods for determining starvation in marine fishes."

MEETINGS AND TRAVEL

Honolulu Laboratory

April 27 - R. Shomura, Director, HL, met with Center Director I. Barrett, J.G. Smith, SWR, San Pedro, California, and D. Gates, Western Pacific Program Office (WPPO), SWR, to discuss monk seal research.

30 - Shomura met in the HL conference room with NMFS Washington officials, WPRFMC members, HL, and SWR personnel to discuss FMP's.

- Dr. R. Skillman represented Shomura at a meeting called by Dr. S. Swerdloff, Manager, Hawaii Fisheries Development Master Plan, to discuss the plan with representatives of various segments of the fishing industry.

May 1 - Shomura participated in the NMFS/Council Management Review Workshop arranged by the WPRFMC.

2 - Shomura attended the WPRFMC's Billfish Advisory Subpanel/Plan Development Team meeting to discuss the 4th draft of the billfish FMP.

3-4 - Messrs. Shomura and Yuen and Dr. R. Mendelssohn attended the 17th WPRFMC meeting at the State Capitol.

4 - Shomura met with Dr. Skillman, E. Mitchell, SWR Legal Counsel, K. Ego, and Swerdloff, HDFG, and Mr. Gates to discuss confidentiality of data.

5 - Messrs. Shomura, Uchida, and R. Iverson, WPPO, met with Messrs. L. Chikami and G. Fukazaki from the purse seiner, Jeannette C., for a briefing on skipjack tuna fishing conditions in Hawaiian waters.

- At the invitation of A. Gerakas, Chairman/President, Pacific Tuna Development Foundation (PTDF), Shomura attended a reception on board the Jeannette C. which is under contract to PTDF to do fishery exploration work in Hawaiian waters.

9 - Messrs. Shomura, Ito, and Uchida attended an evening meeting of the local Fish Dealers Association at Tamashiro Market to discuss the role of NMFS in ciguatera research.

14 - Shomura and Skillman attended a meeting at HDFG to discuss the NMFS Fishery Information System.

18 - Shomura and other HL employees attended a luncheon at the Hilton Hawaiian Village Hotel in observance of "Federal Day" in Honolulu. The outstanding Federal employees for 1979 were announced at the luncheon. Marian Yong, Mathematician, was the HL nominee for this event.

23 - Messrs. Shomura and Yuen attended a meeting called by UH Sea Grant Program to discuss communication with the public regarding the NWHI study.

28 - Shomura departed Honolulu for La Jolla to attend the Center Management meeting.

La Jolla Laboratory

April 19 - May 2 - J. Jennings, Fishery Biologist with her assistant Biological Technican R. Stives traveled to Honolulu to conduct tests of satellite-linked transmitters on wild Hawaiian spotter dolphins near the Hawaiian Islands.

April 29 - May 1 - Dr. Reuben Lasker traveled to Seattle, Washington to present an invited lecture at the University of Washington College of Fisheries.

April 30 - May 4 - Dr. Dan Huppert was in Washington, D.C. to attend an Economic Analysis Workshop for Fishery Management Plans and to participate in a committee to develop a "Request for Proposal" for the second phase of the Centaur contract to design a national data collection system for socioeconomics.

May 1 - J. Coe, Fishery Biologist, traveled to Long Beach to meet with the staff of the Southwest Region regarding the drafting of a contract for marine mammal interaction.

May 1-3 - The Capture Myopathy Workshop held in the auditorium of the Southwest Fisheries Center. Dr. Warren Stuntz chaired the proceedings.

- Dr. G. Moser was in Seattle, Washington to present a lecture at the University of Washington, College of Fisheries.

2-5 - Director Barrett was in Mexico City to attend the U.S.-Mexico bilateral consultations pursuant to provisions in the U.S.-Mexico Fisheries agreement.

4 - A Billfish Plan Development Team and Advisory Panel met at the Center.

6-17 - Dr. P. Smith traveled to Capetown, South Africa to meet with the staff of the Sea Fisheries Institute at their invitation. Smith discussed a variety of topics in fishery assessment with the staff with particular emphasis on fishery independent methods of stock assessment.

7-8 - Director Barrett participated in the Pacific Council's Scientific and Statistical Committee meeting at the Center.

8 - Alec MacCall, Marine Biologist with the California Department of Fish and Game on detail to the La Jolla Laboratory, presented the third draft Jack Mackerel Plan to the Pacific Fisheries Management Council's (PFMC) Scientific and Statistical Committee in La Jolla.

9 - Director Barrett attended a CalCOFI meeting at the Center and later the same day met with the Pacific Fishery Management Council's Anchovy Subcommittee where A. MacCall of the CF&G reviewed the anchovy model used in the Anchovy Plan.

9-11 - J. Squire was in North Bend, Oregon to attend the Pacific Fishery Management Council meeting to present the latest version of the Billfish Management Plan.

10-11 - Also at the Council meeting the next day, Alec MacCall presented the 3rd draft of the Jack Mackerel Fishery Management Plan.

11 - Lasker was in New York to meet with his co-convenor Ken Sherman regarding publication procedures for the Early Life History of Fish Symposium held earlier in Woods Hole.

12-15 - Lasker traveled to New York to attend an Ocean Science Board meeting on Fisheries Biology at Princeton University.

13-16 - The 30th Annual Tuna Conference was held at Lake Arrowhead, California. It was hosted this year by the SWFC, and Dr. Gary T. Sakagawa, Chief of the Oceanic Fisheries Resources Division at La Jolla, served as Chairman. Center personnel presenting papers at the Conference were Dr. David Au, Dr. R. Michael Laurs and Mr. Ronald G. Rinaldo. Attending from the Honolulu Laboratory were M. Yong; from PEG was P. Sund; and from the La Jolla Laboratory were I. Barrett, J. Carr, N. Bartoo, A. Coan, S. Moore, N. Beerman, R. Evans and D. Mackett.

The Director's Report on Tuna and Tuna-Related Activities at the SWFC for the past year, April 1, 1978 to May 1, 1979 was distributed to the participants at the Conference. Next year's Tuna Conference will be sponsored by the IATTC, named as Chairman for the 1980 Conference is Dr. Alex Wild.

13-17 - E. Barham, T. Jackson and W. Perryman traveled to Bay St. Louis, Mississippi to review and count animals in 9 inch film obtained on an aerial survey.

16-17 - Barrett was in Los Angeles to participate in the University of Southern California Sea Grant Site visit.

17 - Dr. Gary Sakagawa attended the Atlantic Bluefin Management meeting held at the Center.

- Dr. G. Sakagawa attended the 18th meeting of the Marine Mammal Commission at the Stardust Hotel in San Diego.

- J. McMillan was in Los Angeles to attend an Economic Censuses User Conference sponsored by the U.S. Bureau of the Census.

17-18 - F. Kellenberger was in Portland, Oregon to attend a meeting of the Pacific Marine Fisheries Commission.

18 - A meeting of the four Center Directors in NMFS, Barrett of the Southwest, Dayton Alverson of the Northwest and Alaska Fisheries Center, Robert Edwards of the Northeast Center, and William Fox of the Southeast Center was held at the SWFC. In addition, Bob Scott of F5 in Washington, D.C. joined the group.

20-24 - Barrett and Lasker traveled to Mexico City to participate in a CalCOFI/Instituto Nacional de Pesca Committee meeting and a joint Mexico/U.S. scientific group to review the scientific basis for the U.S. anchovy management plan.

22-24 - D. Mackett was in Springfield, Virginia to attend a National Conference on Fisheries Development.

22-25 - Dr. D. Huppert traveled to Mexico City to attend discussions of the Anchovy Management Plan.

24 - Dr. G. Moser was in Los Angeles to attend a conference with staff at the Los Angeles County Museum.

29 - Dr. Lasker traveled to El Segundo to present a seminar to members of the Southern California Coastal Water Resources Project.

30-31 - The Center Management meeting was held at the La Jolla Village Inn. Attending from PEG was G. Seckel, N. Abramson from Tiburon, and R. Shomura from Honolulu. G. Howard, J. Gettleman and M. Fraser participated from the SW Region in Terminal Island. From the Center those in attendance were: Barrett, Carr, Mackett, Kellenberger, Remington, Lasker, and Sakagawa.

Pacific Environmental Group

May 9 - June 11 - David Husby traveled to Papeete, Tahiti to participate in a research cruise of NORPAX Shuttle Experiment from Honolulu, Hawaii to Tahiti.

May 10 - Paul Sund traveled to Tiburon, California to discuss the Ship of Opportunity Program and pick up equipment from the Tiburon Laboratory.

22 - Kathy Link traveled to Monterey to discuss XBT sampling procedures with PEG staff and to review operation of micro-computer data logger.

Tiburon Laboratory

May 2 - Roger Green and Daniel Ralph traveled to Oroville, California, to service the National Marine Fisheries Service's equipment at the Feather River Fish Hatchery.

- A meeting was held at the Tiburon Laboratory which included representatives from U.C. Davis Sea Grant and Bay Area sport fishermen regarding acquisition of live, mature sturgeon for hatchery experimental work at Davis.

6-10 - Ed Ueber traveled to La Jolla, California, to attend the Scientific and Statistical Committee Meeting on the Dungeness Crab Plan; he then continued on to Santa Barbara, San Luis Obispo, and Monterey, California, to talk with fishermen and processors regarding the Groundfish Plan.

10 - Brian Jarvis collected striped bass samples from the California Department of Fish and Game traps at Clarksburg, California.

14-18 - Ed Ueber traveled to Seattle, Washington to meet with the Groundfish Planning Team.

- Susan Smith traveled to Eureka, California to attend an FDA Seminar on Shellfish Purification.

14-23 - Dr. William H. Lenarz attended the Pacific Fishery Management Council's Groundfish Team Meeting in Seattle, Washington. While in Seattle, he also attended a series of lectures on mark and recapture population estimates at the Fisheries Research Institute, University of Washington.

22 - Tina Echeverria traveled to Long Beach, California to meet with John Fitch, Califoria Department of Fish and Game.

29-31 - A joint meeting was held at the Tiburon Laboratory sponsored by the New England Fishery Management Council and the Pacific Fishery Management Council, with the participation of the Northeast Region and Center, Northwest Region and Center, and the Southwest Fisheries Center of the National Marine Fisheries Service. Attendees at the meeting discussed problems associated with multispecies management to identify specifically areas of concern in the Pacific Northeast and Alaskan Fisheries Management Plans on groundfish. The meeting was hosted by the Tiburon Laboratory and chaired by Ed Ueber, Economist.

VISITORS

Honolulu Laboratory

April 30 - Austin R. Magill, NMFS, Washington, D.C.

May 7 - George Patrenos, Florida Department of Natural Resources, Tallahassee, Florida.

10 - Les Chikami, a co-owner of the purse seiner Jeannette C., visited T. Otsu to obtain data on Japanese skipjack tuna boat operations near the Hawaiian Islands and to discuss various matters pertinent to their PTDF charter.

14 - Charles Hooker, Minister, Department of Primary Industry, and Mr. Roy Evara, both in the Department of Agriculture, Government of Papua New Guinea, Konedobu, Papua New Guinea.

17 - George Balazs, Hawaii Institute of Marine Biology, UH, visited Shomura to discuss the turtle workshop scheduled for July 31 - August 2 in Honolulu.

18 - Jack Nosaka, proprieter of Universe Seafood, Ltd., called on Otsu to discuss the importation of bigeye scad or jack mackerel which he hopes to process into dried fish for the local market.

21 - Sam Pooley, HDFG, discussed the State's Fishery Development Plan with Mr. Shomura.

22 - Emerald Yeh, KHVH-TV (Channel 4) reporter, visited Shomura to discuss fisheries in Hawaii. She was provided a copy of a manuscript, "Per capita annual utilization and consumption of fish and shellfish in Hawaii, 1970-77," by Ms. Linda Hudgins.

- Scott Hamaguchi of the UH Sea Grant Program visited H. Yuen.

La Jolla Laboratory

April 30 - Graham King, Pacific Marine Fisheries Commission at the Center to meet with Fred Kellenberger, Data Systems Manager.

May 7-8 - Kyoichi Kawaguchi, Chief of Planning and Coordination of Fisheries Research, Japan Fishery Agency, visited the Center to discuss U.S. fishery development and conservation programs.

7 - Margo Kelly, NOAA, and Dick Mailer, Department of Commerce, Washington, D.C. were at the Center for a meeting with Kellenberger on ADP requirements for the Southwest Region and Center.

8 - Dick Heimann, California Department of Fish and Game at the Center to meet with Drs. Perrin and W. Stuntz.

17 - Andrew M. Vrooman, F52, NMFS, Washington, D.C.

29 - Dr. Paul Callaghan, University of Guam and Western Pacific Regional Fisheries Council, Agana, Guam.

30 - Gerry Howard and Jerry Gettleman of the Southwest Region and Mike Fraser attended the Center Management meeting.

31 - Dr. Robert McKelvey, Professor of Mathematics, University of Montana.

- Carol Voit, NOAA, NMFS, Washington, D.C. attended the Center Management meeting.

- Leo Pinkas, California Department of Fish and Game.

Tiburon Laboratory

May 1 - Rex Austin, Member of Parliament for Awarua, New Zealand.

2 - Wally Clark, University of California, Davis, CA.

- David Powell, Steinhart Aquarium, San Francisco, CA.

4 - Leon Hallacher, San Francisco State University, San Francisco, CA.

- Marvin Jung, State Water Resources Control Board, Sacramento, CA.

9 - Harold K. Chadwick, California Department of Fish and Game, Stockton, CA.

- Perry L. Herrgesell, California Department of Fish and Game, Stockton, CA.

24 - Pete Chorney, Southwest Region, Terminal Island, CA.

25 - Margaret Bradbury, San Francisco State University, San Francisco, CA.

- Dr. M. Bradley, San Francisco State University, San Francisco, CA.

- Mike Hearne, San Francisco State University, San Francisco, CA.

- Susan C. Goodwin, Ecological Analysts, Concord, CA.

- M. McGowan, San Francisco State University, San Francisco, CA.

- Gail H. Theilacker, SWFC, La Jolla, CA.

29 - Jack Baxter, California Department of Fish and Game, Menlo Park, CA.

- Dr. Donald E. Bevan, College of Fisheries, University of Washington, Seattle, WA.

- Gene DiDonato, University of Washington, Seattle, WA.

- Thomas Dark, Northwest and Alaska Fisheries Center, Seattle, WA.

- Robert Demory, Oregon Department of Fish and Wildlife Newport, OR.

- Tom Jow, California Department of Fish and Game, Menlo Park, CA.

- H.A. Larkins, Northwest and Alaska Fisheries Center, Seattle, WA.

- Robert E. Loeffel, Oregon Department of Fish and Wildlife, Newport, OR.

- Glen K. Mahoney, Northeast Regional Office, Gloucester, MA.

- Douglas G. Marshall, New England Fishery Management Council, Peabody, MA.

- Alan Millikan, Washington Department of Fisheries, University of Washington, Seattle, WA.

- Lorry M. Nakatsu, Pacific Fishery Management Council, Portland, OR.

- Dr. Bruce Rettig, Oregon State University, Corvallis, OR.

- Howard J. Russell, Jr., New England Fishery Management Council, Peabody, MA.

- Michael Sissenwine, NMFS, Woods Hole, MA.

- Lawrence D. Six, Pacific Fishery Management Council, Portland, OR.

- Lars Videas, New England Fishery Management Council, Peabody, MA.

- James Wilson, New England Fishery Management Council, Peabody, MA.

31 - William T. Davoren, U.S. Fish and Wildlife Service, Sacramento, CA.

PERSONNEL

Honolulu Laboratory

May 1 - William P. Haus, Biological Aid (Fisheries), Termination (work completed).

7 - Andrea S. Johnson, Time and Leave Clerk, Part-Time 700-h Appointment.

9 - Brian Joyo, Biological Technician (Microbiology), 700-h Appointment.

- Cora Nagamine, Data Transcriber, 700-h Appointment.

14 - Sharon D. Hendrix, Biological Aid (Fisheries), Part-Time 700-h Appointment.

18 - Lisa A. Katekaru, Computer Aid, Resignation.

La Jolla Laboratory

April 27 - Harold Dorr, Biological Technician (Fisheries), Temporary Appointment.

May 1 - Philip Tarantino, Statistical Clerk, Temporary Appointment.

2 - Noelle Beerman, Statistical Assistant, Temporary Appointment.

6 - John Henderson, Biological Technician, Promotion.

11 - Andrew Axelrod, Computer Aid, Resignation.

June 3 - Sandra A. Paez, NOAA Junior Fellow, will enter on duty June 18, 1979.

Tiburon Laboratory

May 10 - Mark E. Kobe, Biological Technician, 130-day Appointment.

29 - Nancy Stapp, Co-op Student, Return to Duty.

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